Chapter-2

Review of Related Literature

2.1 Studies of Physiological Parameters

2.2 Studies of Psychological Parameters

2.3 Studies on Physical Fitness Parameters

2.4 Studies on General Physical Component
Review of related literature

It is established in the field of thesis that the review of related literature is an important part of the successful research for getting a full picture by what has been done with regard to the problem under study. Such review brings about a deep and clear perspective of the overall field.

The review of related literature helps the scholar to discover what is already known, what others have attempted to find out, what methods of approach have been established or disappeared and what problems remain to be solved.

The investigator had traced out different types of research work like dissertation, thesis, journals, and relevant studies, varieties of relevant books on physical education, games and sports. For this purpose, he had visited number of libraries including central library of Kalyani University and library of physical education, department of Kalyani University. The researcher also had searched various related websites on internet.

The related literatures were broadly classified into the four categories:-

1) Studies on physiological parameters
2) Studies on psychological parameters.
3). Studies on physical fitness parameters
4) Studies on general physical component.

2.1 Studies of Physiological parameters

2.1.1 Heart Rate

Chaudhary (2010) evaluated the effects of aerobic and strength training on cardiac variables such as blood pressure, heart rate (HR), and metabolic
parameters like cholesterol, high density lipoprotein (HDL), triglycerides and anthropometric parameters of obese women of Punjab. This study was performed as an experimental study, in which subjects were randomly selected. There were thirty obese women, aged between 35-45 yrs with body mass index (BMI) of above 30. Subjects were group into control (n=10), aerobic training (n=10) and resistance training (n=10). Aerobic training was given for three days a week at 60-70% of maximum HR for 6 weeks. Resistance training (Delorme and Watkins Technique) was given for alternate days for 6 weeks. HR and blood pressure were measured before and after the exercise. Recovery HR was also measured. The findings of the study indicate statistically significant differences in recovery heart rate (Pre exercise: 97.40±5.378 [mean ± standard deviation (SD)], post-exercise: 90.70±4.599, t=8.066, P<0.001).

Levy WC and others (1998) concluded that Heart rate variability (HRV) (SD of the RR interval), an index of parasympathetic tone, was measured at rest and during exercise in 13 healthy older men (age 60 to 82 years) and 11 healthy young men (age 24 to 32 years) before and after 6 months of aerobic exercise training. Before exercise training, the older subjects had a 47% lower HRV at rest compared with the young subjects (31± 5ms vs. 58± 4ms, p=0.0002). During peak exercise, the older subjects had less parasympathetic withdrawal than the young subjects (-45% vs. -84%, p=0.0001). Six months of intensive aerobic exercise training increased maximum oxygen consumption by 21% in the older group and 17% in the young group (analysis of variance: overall training effect, p=0.0001; training effects in young vs. old, p=NS). Training decreased the heart rate at rest in both the older (-9 beats/min) and the young groups (-5 beats/min, before vs after, p=0.0001). Exercise training increased HRV at rest (p=0.009) by 68% in the older subjects (31±5ms to 52±8ms) and by 17% in the young subject (58±4ms to 68±6ms). Exercise training increases parasympathetic tone at rest in both the healthy older and young men, which may contribute to the reduction in mortality associated with regular exercise.
Wilmore and others (1996) determined the effects of a 20-wk endurance training program (The HERITAGE Family Study) on resting heart rate (HR rest). HRrest was obtained on a sample of 26 men and 21 women during sleep; during resting metabolic rate and resting blood pressure measurement periods in the early morning following a 12-h fast and 24-h post exercise; and at prior a maximal bout of exercise. Following training, the subjects exhibited a 16.0+ 9.4% (mean+ SD) increase in VO₂max (P<0.05), but the HRrest for each of the resting conditions was decreased by only 1.9 to 3.4 bpm (P<0.05), or an average across the three conditions of 2.7 bpm. In a large sample of 253 HERITAGE subjects. HRrest obtained only at the time of the resting pressure measurement decreased by only 2.6 bpm, while VO₂max increased 17.7+10.0%. It is concluded that there is a significant, but small, decrease in resting heart rate as a result of 10 wk of moderate to high intensity endurance training; which suggests a minimal alteration in either, or both, intrinsic heart rate and autonomic control of HRrest.

Garber and others (1992) evaluated the physiological effects of an 8 weeks aerobic dance program to those of a walk jog exercise training program. Sixty male and female University employees ages 24-48 were randomly assigned to an aerobic dance program (N=22), a walk-jog program (N=24), or a sedentary control group (N=15). Subjects who had an exercise compliance rate less than or equal to 85% were dropped from the study, as were control subjects who had scheduling conflict or illness precluding post treatment testing. Thirty five subjects completed the 8 weeks period with a compliance rate greater than or equal to 85% leaving 14 in the aerobic group, 11 in the walk-jog group and 10 in the control group. A significant increase (P less than 0.001) in maximal oxygen uptake occurred in the aerobic (+3.9 ml/kg/min) and walk-jog group (+3.4ml/kg/min) while no significant change was observed in the control group. Peak heart rate decreased significantly (P<0.05) in the aerobics (-4h/min) period. Body weight, peak respiratory exchange rate and peak minute ventilation remained the same in the aerobic walk-jog and control groups throughout the treatment period. It is concluded that aerobic dance
program can result in similar improvements in aerobic power as a walk-jog program. Thus, an aerobic dance program as an effective alternative to a traditional walk jog training regime.

2.1.2 Systolic Blood Pressure

Saremil A. (2010) examined the effects of 12 weeks of aerobic training on serum chemerin levels in association with cardiovascular risk factors in overweight and obese males. Twenty one overweight and obese subjects [44.3 (± 4.1 years, body mass index (BMI) 25 kg/m²] were assigned to exercise training (obese EX, n=11) and control (obese CON, n=10) groups. The obese EX group participated in 12 weeks of progressive aerobic training 5 days a week. Serum chemerin, insulin resistance, lipid profiles, and blood composition were all measured before and after the training. After the aerobic training systolic blood pressure (P=0.04) of participants were significantly decreased.

Bruce S. Alpert and others (1994) stated that there is little evidence to support the efficiency of exercise training for reducing resting blood pressure in normotensive adolescents, although several studies reported small decreases in either or both systolic and diastolic pressure. In hypertensive adolescents, aerobic-type exercise training consistently reduced both systolic and diastolic pressure, but seldom to completely normal levels. Resistance training has not been studied as extensively, may be some benefit.

Kelly and Johnson (1994) conducted a study on the effects of aerobic exercise on resting systolic and resting diastolic blood pressure among normotensive adults 438 subjects (289 exercise, 149 control) were statistically aggregated using the meta-analytic technique small treatment effect (TE) reductions were noted for both resting systolic and diastolic blood pressure. The results of this study suggest that aerobic exercise resulted in small reduction on resting systolic and diastolic blood pressure among normotensive adults.
2.1.3 Diastolic Blood Pressure

Cornelissen and Fagard (2005) examined the previous meta-analyses of randomized controlled trials on the effects of chronic dynamic aerobic endurance training on blood pressure reported on resting blood pressure only. Inclusion criteria of studies were random allocation to intervention and control; endurance training as the sole intervention; inclusion of healthy sedentary normotensive or hypertensive adults; intervention duration of ≥4 weeks; availability of systolic and diastolic blood pressure; and publication in a pre-reviewed journal up to December, 2003. The meta-analysis involved 72 trials, 105 study groups, and 3936 participants. After waiting for the number of trained participants and using a random effects model, training induced significant net reductions of resting and daytime ambulatory blood pressure of, respectively, 3.0/2.4mm Hg (P<0.001), and 3.3/3.5mm/Hg (P<0.001). In conclusion, aerobic endurance training decreases blood pressure through a reduction of vascular resistance, in which the sympathetic nervous system and the rennin angiotensin system appear to be involved, and favorably affects concomitant cardiovascular risk factors.

The study of George A. Kelley and others (2003) stated that resting blood pressure in children and adolescents can track into adulthood. The purpose of this study was to use the meta-analytic approach to examine the effects of exercise on resting systolic and diastolic blood pressure in children and adolescents. Twelve randomized, controlled trails representing 16 outcomes in 1266 subjects met the inclusion criteria. Reductions in blood pressure were approximately 1% and 3% for resting systolic and diastolic blood pressures, respectively. However, random-effect modeling using 5000 bootstrap confidence intervals revealed that neither result was statistically significant (systolic, ± SEM=-1±2; 95% bootstrap confidence intervals=-2 to 0 mm Hg; diastolic, ± SEM=-1±2; 95% bootstrap confident intervals =-3 to 0mm Hg). The results of this suggest that short-term exercise dose not appear to reduce resting systolic and diastolic blood pressure in children and
adolescents. However, a need exists for additional studies, especially in hypertensive children and adolescents.

It has been suggested that blood pressure levels during childhood and adolescence track into adulthood. One possible intervention that has particular appeal is exercise, a low-cost nonpharmacologic intervention that is available to most children and adolescents. However, randomized, controlled trails on this topic have led to less then overwhelming results, 2-15 with only 26% and 32% of the outcomes from studies reporting statistically significant decreases in resting systolic and diastolic blood pressure. One of the possible reasons for the lack of statistically significant results may have been the small number of sample of sample size for some of these studies. Meta-analysis is a quantitative approach in which the major goal is to combine the result of individual studies in order to arrive at an overall conclusion about a body of research. This approach is especially appropriate when the number of studies is small and/ or the number subjects that can be enrolled in any one study is small. 16 To date, we are not aware of any meta-analytic work in which the effects of exercise on resting systolic and diastolic blood pressure in children and adolescents have been examined. Therefore, the purpose of this study was to use the meta-analytic approach to examine the effects of exercise on resting systolic and diastolic blood pressure in children and adolescents.

Cox, K.L. (2001) randomly assigned to either a supervised center based evaluated the long term effects of regular to moderate intensity exercise on blood pressure and blood lipids in previously sedentary older women. Subjects were randomly assigned to either a supervised center based or a minimally supervised home based exercise program, initially for 6 months. Within each program, subjects were further randomized to exercise either at a moderate (40-55%) heart rate reserve, or vigorous exercise program for another twelve months. Methods: Healthy, sedentary women (aged 40-65 years) (n=126) were recruited from the community. In this largely normotensive population of
older women, a moderate, but not vigorous exercise program, achieved sustained falls in resting systolic and diastolic blood pressure over 18 months.

2.1.4 Breath Holding Capacity

The purpose of the study of Mr. Chandrasekar and others (2012) was to find the effect of different fitness training program on cardio-respiratory endurance and Breath holding time. For this purpose, thirty boys those who were studying in various schools and aged between 16 and 17 years from Andaman and Nicobar Islands, were selected. They were divided into three equal groups, each group consisted of ten subjects, in which group-I underwent interval training, group-II underwent circuit training and group-III acted as control group who did not participate in any special training. The training period for this study was three days in a week for twelve weeks. Prior to and after the training period the subjects were tested for cardio-respiratory endurance, and blood breath holding time. The selected criterion variables were tested with Cooper’s twelve minutes run/walk test and holding the breath for maximum duration in seconds. The statistical tool applied for the present study was Analysis of Covariance (ANCOVA). Since, three groups were involved; the Scheffe’s test was applied as post-hoc test. From the results of the study, it was concluded that both the trainings i.e. interval training and circuit training has improved the cardio-respiratory endurance and breath holding time.

The purpose of the research of Vishan Singh and others (2012) was to determine the effect of 8 weeks yoga practices (Pranayama) on Breath holding capacity of school going children of Rajasthan. The method of this study was experimental research and sample were 30 students of senior secondary school of Rajasthan (12-15 Aged). Thirty subjects were randomized into two groups experimental group accomplished yoga practice (Pranayama) for eight weeks. Paired sample ‘t’ test was used to analyzed the data of the study in use of SPSS software. Result showed that eight weeks pranayama significantly increased the breath holding time of school children. It is also recommended other parameters of respiratory system need to investigate for further information of
Rajasthan. The result showed that yogic practices significantly influenced on Breath holding time. It also showed that increase in capacities related to Breath holding time like $O_2$ consumption, tolerance capacity. Therefore, it was concluded that various parameters of respiratory improved after pranayama and also revealed a significant increase in force vital capacity, peak respiratory flow rate and maximum voluntary ventilation.

Durgalakshmi (1989) conducted a study on “Effect of yogic exercises on selected physiological variables of high School Boys”. The group consisted of 60 students. The results of the study showed that systolic pressure was increased and diastolic pressure remains unchanged after a six weeks training of yoga. The scores in breath holding time and vital capacity had also improved. It was statistically significant. She also recommended that the athletes could adopt these exercises and thereby increase in the cardio respiratory function and further she adds, yoga could be included in the regular program of physical education in schools and colleges.

In the Book ‘The physiology of Exercise’ by MC Curdy and Lerson (1939) who observed that breath holding capacity increased significantly during training.

2.1.5 Hemoglobin%

Abbass Ghanbari-Niaki (2013) examined the effects of a circuit resistance training session with a light intensity on some hematological parameters of male students of physical Education. After the release of an announcement and call, 20 male students of physical Education voluntarily participated in the study. After equalization, they were randomly divided into two groups including light-intensity exercise (35% of a maximum repetition) and no exercise (the control). Persons in the first group were asked to perform 10 steps circuit exercise for three non stop alternating rounds with a rest period at each round. Hematological parameters measured included white blood cell, platelet variables, and red blood cells. Data was analyzed using SPSS software.
To compare the means before and after the exercise and to compare to groups with each other, dependent t-test and independent t-test were used respectively. Results showed that none of the variables related to white blood cell and platelet had a significant change in the group light-intensity exercise (35% of a maximum repetition) and only mean corpuscular volume (MCV), among the variables related to red blood cells, decreased significantly. In the control group, a significant increase in neutrophil percent (NEUT) and hemoglobin and a significant decrease in lymphocyte percent (LYM) were observed. Others variables showed no significant change in this group. In addition, there was no difference between the groups.

James T. Annesi (2013) stated that BMI, volume of physical activity, and HbA1c each significantly improved. The effect sizes were small for BMI and HbA1c change, and moderate for change in volume of physical activity. Changes in BMI and volume of physical activity accounted for a significant portion of the variance in change in HbA1c, $R^2=.13$, $F_2=4.05$, $p=0.23$. Change in volume of physical activity, but not change in BMI, significantly contributed to the explained variance HbA1c change. These results did not appreciably differ when baseline scores on BMI and HbA1c were controlled (thus, corresponding findings are not reported). Age of participants was homogenous so it was entered in to the analysis. The relationship between increased physical activity and reduced BMI, both not controlling and controlling for baseline values, were significant and marginally significant.

Akbar Sazvar (2012) examined on “the effect of morning aerobic exercise on some hematological parameters in young, active males.” This study is to investigate the impact of an eight-week morning aerobic training on some hematological parameters in young, active males. 26 male, university students without any previous smoking experiences or regular exercise programs (age $19/23 \pm 1/07$ years and BMI, $22/53\pm 5$ kg/m$^2$) were randomly selected and divided into two groups: control and exercise. The exercise group (13 students) did an 8-week aerobic training three times a weeks with the intensity of 55% to
75% of maximum heart rate but the control groups just (13 students) did their everyday activities. Blood samples were collected the first session of aerobic training and after the last session, at a specific time (7:00 a.m.) from both control and exercise group. The second blood samples were collected after the heart rate of the exercise group returned to its resting values and were used to examine the following parameters: clotting and bleeding time, amount of fibrinogen, hemoglobin, hematocrit and number of red and white blood cells and platelets. A timer, a fibrinogen kit and a cell counter were used in this phase. Student t-test and paired T-test were run to analyze the obtained results. The significance level was set at P=0.05. The finding showed that during an 8-weeks morning exercise the number of red blood cells, hemoglobin levels, and hematocrit percentage increased. Fibrinogen levels and prothrombin formation time have also increased significantly (P<0.05), while the bleeding times and the number of platelets decreased significantly. The findings of this study reveal that an eight-week morning aerobic training dose not has any negative effect on hematological parameters of young, active males with healthy metabolic, kidney and cardio respiratory systems.

The aim of study of Sunita Choudhary and others (2011) was to the impact of exercise in trained and untrained exercise performers on serum iron, blood hemoglobin and cardiac efficiency through quantified exercise on Harvard steps. The present study was carried out on 13 male medical and compared it with 10 male athletes in the age group of 18 to 25 years at Dr. Sampurnanand Medical College, Jodhpur. The biochemical parameter was serum iron and hemodynamic parameters measured were hemoglobin, pulse rate and blood pressure in both the groups after overnight rest and after quantified bout of exercise for 5 minutes on Harvard step. Serum iron fell from pre-exercise level and was more marked (p<0.01) in untrained. After exercise there was significant rise (p<0.001) of hemoglobin and pulse rate in untrained (p<0.001). A significant increase in systolic blood pressure in case of untrained boys (p<0.01) and athletes (p<0.001) was observed. Whereas decrease in
diastolic blood pressure was observed in both the groups but decrease in
diastolic blood pressure were more marked in athletes (p<0.001). Exercise
induces improvement in hemodynamic status.

Jankiram, E. (2006) conducted a study on the effects of yoga and
meditation cognitive, physical and hematological variables of school children
aged between 11 to 16 years. Physical and cognitive factors determine sporting
achievements in all the games and sport. He tested both experimental and
control groups before the start. He gave 12 week’s yoga training and
meditation to the experimental group and tested both yoga and control groups
again. The results of the yoga experimental group (n=20) was significantly
improved than those of the control group (n=20) in all physical, cognitive and
hematological variables (p<0.05). The assessments showed that the cognitive
variables difference were much superior to the control group.

Dr. Ambrarish V (2005) examined that 44 healthy normal volunteers; 26
males and 28 females in the age group of 18 to 30 years studying in various
courses in M.S. Ramaiah Medical College and Hospital were chosen for his
study. Prior consent was taken from all of them before inducting them into the
study. All the subjects were made to do one bout of moderate exercise (acute
moderate exercise), one bout of strenuous exercise, 20 from amongst the 54
were made to do 1 month of scheduled moderate exercise done on a daily basis.
The subjects performed acute moderate exercise on the first day and acute
strenuous exercise on the second day. The result of the plasma hemoglobin
level showed a slight increase with acute moderate exercise and further rise
with acute strenuous exercise and remained a little high compared to the
baseline after on month of scheduled moderate exercise. The rise with acute
moderate and acute strenuous exercise may be attributed to hemo concentration
due to sweating and release of move red blood cells from structures such as the
spleen and bone marrow to meet the increased oxygen demand of the body.
The rise after one month of moderate scheduled exercise may be attributed to
increase in muscle mass.
In the thesis B. Sivakumar (2005) stated that hemoglobin and packed cell volume were developed significantly by aerobic exercise group and yogic practices group when compared to the control group. It is also found that the improvement caused by aerobic exercises group was greater when compared to the effects caused by yogic practice group. Aerobic refers to the variety of exercise that stimulates heart function and lungs activity for a time period sufficiently long to produce beneficial changes in the body. The heart is always able to deliver sufficient oxygen rich blood to muscles. So that it derives energy from fat and glycogen aerobically, it increases the efficiency of heart circulation and muscles.

2.1.6 Fat%

Ramesh and Subramaniam (2011) conducted a study on the effect of aerobic and calisthenics exercise on health related physical fitness variables such as muscular strength, muscular endurance, flexibility, cardio respiratory endurance and body mass index (BMI) of obese adolescents. Their age ranged from 12 to 18 years. They were divided into two groups and designed as the experimental group and control group. The Experimental group was given aerobic and calisthenics exercise for a period of three months, both morning and evening for five days in a week. However, the control group was not allowed to participate in aerobic and calisthenics exercise training program. The result of this study indicated that muscular strength, muscular endurance, cardio respiratory endurance was significantly improved, and also it was observed that Body mass Index significantly reduced.

Leite, N. (2009) examined the effects of physical exercise and nutritional guidance on body composition, physical fitness, and lipid profile and insulin resistance among obese adolescents with and without metabolic syndrome. Sixty four obese adolescents (26 boys), 10-16 years of age, were divided into two groups: with metabolic syndrome (n=29) and without metabolic syndrome (n=35). They were classified as having metabolic syndrome if they met three or more criteria for age and sex according to the
Adult Treatment Panel III (ATP III). Blood pressure, waist circumference, maximum oxygen uptake (VO2peak), blood glucose, blood insulin, homeostatic model assessment (HOMA-IR), quantitative insulin sensitivity check (QUICKI) and lipid profit were assessed at baseline and after 12 weeks of intervention. Both groups participated in 12 weeks physical education and two nutrition guidance sessions. Each physical education session consisted of 50 min indoor cycling, 50 min of walking/running and 20 min of stretching, three times a week. Results: Fifty-five participants (with metabolic syndrome=25, without metabolic syndrome=30) completed the treatment. After 12 weeks, both groups showed reduction in body weight, BMI z-score, waist circumference, fat mass and triglycerides, and increases in height, HDL-C and VO2 peak (p<0.05). In addition, the group with metabolic syndrome presented reduced systolic blood pressure and increased insulin sensitivity (p<0.05). The risk factors for metabolic syndrome decreased by 72% following the multidisciplinary intervention, the risk factors decreased, with improvements in physical fitness and metabolic profile. The multidisciplinary intervention was effective in reducing metabolic syndrome.

Slawta, J. (2008) studied a Fit kid a 12 weeks program aimed at improving physical activity and nutritional habits in children. The physical activity component of the program emphasized cardiovascular fitness, flexibility, muscular strength, and bone development through running, yoga, jumping, and strength exercises. All activities were individualized and noncompetitive. The nutrition component focused on current dietary guidelines that emphasize a diet rich in vegetables, fruits, unsaturated fats, and whole grains, and low in saturated fat and sugar. Following the 12 week intervention, significant improvements were observed in body composition, fitness, nutrition knowledge, dietary habits, and in those who participated 75% of the time, significant reductions in total cholesterol and triglyceride levels were observed. Finding from the pilot trial suggest that health promotion programs can be well received by children and may favorably alter overweight and the development of adult lifestyle-related diseases.
Ashok Kumar and others (2006) examined the effect of a three-month conditioning program consisting of exercises targeted to improve flexibility, strength and cardio respiratory endurance, on Subcutaneous Fat and Lean Body Mass percent (LBM%) in fifty (N=50) physically active males aged (18-24) years. Bioelectrical Impedance Analysis was used for total body composition assessment and subcutaneous fat distribution was measured with the help of skinfold thickness from selected body sites (Biceps, Triceps, Subscapular, Suprailiac, and Calf). On an average most deposition of fat was noticed in the Subscapular site followed by Calf, Triceps, Suprailiac and Biceps regions in that order before the start of a conditioning program. Conditioning program caused a significant reduction in the subcutaneous fat deposition at all sites after the completion of first mosocycle of 45 days as well as after the second mosocycle (next 45 days of conditioning). However the conditioning program of 90 days failed to change the distribution pattern of subcutaneous fat in the observed sites. On the body composition front, the mean values of total body fat percent demonstrated a decrease after the conditioning program (before 19.83+5.50 and after 17.7+5.36) but this decrease was not statistically significant (p<0.05). Similarly, the mean values of total body IBM% demonstrated increase after a conditioning program (before 80.16+5.50 and after 82.3+5.44) but again this increase was also not statistical significant. These findings indicate that a conditioning program on the one hand statistically significantly lowers skin fold thickness by mobilizing and using the stored fat (subcutaneous) from various sites and on the other hand although there was a difference in the mean values of total body Fat percent and total LBM percent after a conditioning but that difference was not statistical significant.

2.2 Studies on Psychological Parameters

2.2.1 Anxiety

Dr. T. Prabhanakar Reddy (2013) has shown that different exercise modules and yogic practices have been claimed to reduce anxiety. However,
there are very few longitudinal studies to assess and to compare improvement in mental health of subjects performing yogic asana and breathing exercises versus those performing endurance exercises like swimming. Therefore, present study was designed to compare reduction in anxiety levels with yogic postures and breathing exercises with that of swimming. This study was conducted in the department of physiology. Study design used was prospective randomized comparative study. Hundred volunteers were included in the study and randomly divided into two groups, one practiced yogic asanas and breathing exercises and other practiced swimming for 12 weeks. Beck’s anxiety inventory was used to asanas anxiety level of subjects. Anxiety levels were assessed prior to the training and then after 12 weeks of training. The total score was calculated from 21 items and high scores indicated higher anxiety levels. The average anxiety scores decreased significantly (p<0.0001) in both the groups after training. In yoga group, average pre training score of 24.25 decreased to post training score of 20.27, whereas in swimmer group it decreased from 23.57 to 20.8. However, the decrease in anxiety was similar with both modalities of exercise (p>0.05).

The purpose of the present study of Dr. Kuntal Thakur and others (2013) was to find out the difference between pre and post competitive anxiety and aggression in national level male and yogic practitioners. Total sixty (N=60) national level yogic performers i.e., thirty male performers (Gr. M) and thirty female performers (Gr. F) were randomly selected from National level School Yogasanas Competition, held at Delhi, 2012. Data were collected from performers using a Sports Competitive Anxiety Test (SCAT) and Sports aggression inventory (SAI) and SCAT consists of fifteen items which include 5 spurious items, 8 positive items and 2 negative items and SAI consists of 25 items which include 13 yes keyed and rest of no keyed. The t-test was used to compare the mean of the anxiety and aggression between pre and post competition. The level significance was set at p<0.05. The result of the study reveals that: - i) Pre-competitive anxiety and aggression of national level for
both male and female yogic performers was higher than post competitive anxiety and aggression. ii) Significant improvement was observed between pre and post competitive anxiety and aggression of both national level male and female yogic performers. iii) Female yogic performers were significantly higher level of anxiety than male yogic performers iv) No significant difference was observed among male and female national level yogic performers in aggression.

Michael T. Rothman (2010) examined the effect of a semester-long exercise program on trait anxiety in undergraduate students. A sample of 627 students participated in a 13-weeks program of exercise (n=402) or attended a Health Education class (n=225) during the same time. Growth curve Analysis (GCA) was used to examine the data across the beginning, middle and end of the study. Initial anxiety level, and not gender, moderated the association between exercise participation and anxiety, such that exercisers experienced significantly lower trait anxiety at the end of the study and a significantly faster decline in trait anxiety (as compared to students in the control group), to the extent that they had higher levels of anxiety at the start of the semester. Clinically significant change was experienced by 66% of clinically anxious exercisers and 20% of clinically anxious control group participants for exercisers, all types of exercise were equally effective in reducing trait anxiety. These investigations, while providing additional evidence for the well-documented impact of chronic exercise on trait anxiety, also provide strong evidence for the role of initial anxiety level in moderating this effect. Employing GCA procedures in the data analysis allowed for a more nuanced examination of an effect which has received significant attention in both the exercise physiology and clinical psychology literature over the past 30 years. Implications of the study findings are discussed with respect to clinical applications and future research in this field.

Stich (1998) studied in the second Meta analysis that the effects of aerobic and anaerobic exercise on depression and anxiety symptomatology in
subjects with anxiety scores above the 50th percentile. Eleven randomized studies compared the effects of an exercise training with a wait-list control and analyses revealed an effect size of 0.94. Within these comparisons the effect size of studies with formal anxiety disorders (n = 7) was 0.99.

Numerous Meta analyses have been published by Petruzzello and others (1991) on the effect of exercise on anxiety. However, only two have examined the effects of exercise in subjects with increased anxiety levels. In one meta-analysis, 11 studies have been analyzed reporting trait anxiety for subjects being identified as highly anxious; the mean effect size was 0.47, indicating that relative to control, exercise training resulted in a moderate reduction in anxiety.

2.3 Studies on Physical Fitness Parameters

2.3.1 Speed

Atul Meethal and others (2013) conducted a study to find the effects of circuit training on different surfaces on selected physical and physiological variables of school boys. Forty five boys in the age group of 13 to 14 years of Alagappa Modal School, Karaikudi were selected at random and divided randomly into three groups namely mud circuit training group, concrete training group and control group. The experimental groups participated in the training program for a period of 6 weeks. During this period, the control group was let off without any training. The data were collected on selected physical and physiological variables of speed, agility, leg explosive power, pulse rate, blood pressure, aerobic capacity respectively before training (pre-test) as well as after 6 weeks of training (post-test). Analysis of covariance was used to analyze the data. The result of the study clearly indicated that the mud circuit training group had improved the speed, agility, leg explosive power, pulse rate, blood pressure, aerobic capacity to a greater degree that concrete training group.
In the study of Tracie L. Edwards (2012) different training methods are used to improve force, muscular strength, and power. One method is high-resistance (HR), which uses free weights or plate loaded machines. Another training protocol is high-velocity (HV), training which utilizes light loads and high repetitions along with plyometric exercises to increase speed and velocity. HV training is thought to improve overall sprint time performance whereas HR training will improve the initial acceleration phase of the 100m sprint. The purpose of this study was to examine the effects of both HV and HR training programs on overall sprint time performance in female high school students. This study included 30 females from Roswell, New Mexico, ranging in age from 14 to 18 years. The participants, who were not familiar with strength training programs, were selected from the physical education classes at local high schools. For 8 weeks the students participated in either a HV (jumping, bounding, hopping, etc.) or HR (squat, hamstring curls, leg press, leg extension, etc.) training protocol. Both training groups improved the 100 m sprint time from the pre-test to the post test over the training period, however, the results showed no significant between the two groups’ mean change scores on sprint time (F(1,28)=0.062, p>0.05). Follow-up analysis showed the within-subjects results were statistically significant (F (1,28)=18.687, p<0.001) indicating that the 8 weeks of training induced a significant change for individual sprint time performance regardless of protocol.

Mr. D. Balamurugan (2012) concluded a study was to find out the effect of nine weeks resistance training program on physical training program on physical fitness variables. For these purpose twenty men students from SVS College of Engineering, Coimbatore, and Tamilnadu with age of 18 to 22 years were selects as subjects. They were divided into two groups, each group consisted of ten subjects, in which group-I underwent resistance training, group-II acted as control which did not participate any special training, except their regular curricular activities. The training period for this study was three days in a week for nine weeks. Prior to and after the training period, the
subjects were tested for speed, back strength and abdominal strength. The selection criterion variables, such as speed, back strength and abdominal strength. The dependent ‘t’ test and analysis of covariance (ANCOVA) was applied as statistical tool. In all cases 0.05 levels was fixed as significance. It was concluded from the study that the training groups had improved on back strength, and had no significant improvement on the speed and abdominal strength.

Wilson (1993) study was performed to determine which of there theoretically optimal resistance-training modalities in the greatest enhancement in the performance of a series of dynamic athletic activities. The three training modalities include: (1) traditional weight training (2) plyometric training (3) explosive weight training at the load that maximized mechanical power output. 64 previously trained subjects were randomly allocated to four groups that included the above 3 training modalities and a control group. The experimental groups trained for 10 weeks performing heavy squat lifts, depth jumps or weighted squat jumps. All subjects were tested prior to training, after 5 weeks of training and at the competition of the training periods. The test items included (1) 30mts sprint (2) vertical jumps performance with and without counter movement (3) maximal cycle test (4) iso-kinetic leg extension test, and (5) isometric test. The experimental group which trained with the load maximized mechanical power achievement the best overall results in enhancing dynamic athletic performance recording statistically significant (p<0.05) improvements on most test items and showing statistically superior results from the two other training modalities on the jumping and the iso-kinetic test.

Scott (1982) conducted a study on comparison of a circuit strength training program and a sport activity program as measured by performance on the AAHPERD youth fitness test. 54 male subjects were participated in the study (11-14 years of age) circuit training group participated in a combination of weight training and sport activities. While sports activity group participated in a straight sports activity program. The result proved the circuit training
group improved in pull-ups, shuttle run, standing broad jump and 50 yard dash
the sports activity group improved in sit-ups shuttle run, standing broad jump
and 50 yard dash.

2.3.2 Strength

Shawn Johnson and others (2013) conducted a study to find the effects
of exercise sequence in resistance-training on strength, speed, and agility in
High School Football Players. Manipulating variables in a training program
(e.g., sets, reps, lifts, sequence, etc.) is designed to maximize strength and the
power performance. Due to the complexity of designing resistance-training
programs, changing one variable could potentially set an athletic team from
others in performance. The purpose of this study was to investigate if exercise
sequence could influence the development of strength, speed, and agility. This
study compared two specific types of exercise sequences: traditional which
performs the prescribed exercise in a traditional or blocked manner (by
completing every set of an exercise before moving to the next); and circuit,
which performs the prescribed exercises in a circuit or alternating manner (by
completing the first set of each prescribed exercise, then going to the second set
of each exercise). Thirty-nine adolescent athletes from two separate high
school football teams completed identical six-week resistance-training
programs with the only difference being the sequence of the exercises. Each
group tested pre-and post-intervention on hang clean, bench squat, 40 yard
dash and pro agility. A strength index was used to measure overall strength
gained by dividing the sum of the three lifts by total body weight. The results
demonstrated that the only significant difference between groups occurred with
hang clean. Both circuit and traditional groups made significant but equal gains
when compared independently pre-to post-intervention. These results suggest
that if strength gains are desired, then either a circuit or traditional style of
exercise sequence will produce equal results regardless of beginning level of
strength.
Dr. B.K. Joshi & Dr. V. S. Vakani (2013) concluded a study to find out the effect of plyometric training on strength and endurance of abdominal muscles, leg strength, thigh girth and calf girth. The study conducted on 25 students, who selected randomly from three years degree course B.P.E. from Mahadav Desai Sharirik Shikshan Mahavidyalaya Sadra, Gandhinagar. Run by Gujarat Vidyapith, Ahmedabad, one experimental group designed within these 25 students. The pre and post test were conducted before and after completion of six week training program. Which was Bent knee sit ups for strength and endurance of abdominal muscles, vertical jump test for leg strength and circumference of thigh and calf by steal tape. T-test was used to test the effect of plyometric training on variables used in the present study. The result of the study reveals that there was significant difference in 0.05 levels of strength and endurance of abdominal muscles, Leg Strength and calf girth among the subjects.

Marios (2006) to examine the effects of a progressive resistance training program in addition to soccer training on the physical capacities of male adolescents. Eighteen soccer players (age: 12-15 years) were separated in a soccer (SOC; n=9) and a strength-soccer (STR; n=9) training group and 8 subjects of similar age constituted a control group. All players followed a soccer training program 5 times a week for the development of technical and tactical skills. In addition, the STR group followed a strength training program twice a week for 16 weeks. The program included 10 exercises, and at each exercises, 2-3 sets of 8-15 repetitions with a load 55-80% of 1 repetition maximum (1 RM). Maximum strength ([1 RM] leg press, bench-press), jumping ability (squat jump [SJ], countermovement jump [CMJ], repeated jumps for 30 seconds) running speed (30m, 10 x 5-m shuttle run), flexibility (seat and reach), and soccer technique were measured at the beginning, after 8 weeks, and at the end of the training period. After 16 weeks of training, 1RM leg press, 10 x 5m shuttle run speed, and performance in soccer technique were higher (p< 0.05) for the STR and the SOC groups than for the control group.
One repetition maximum bench press and leg press, SJ and CMJ height and 30-m speed were higher (p<0.05) for the STR group compared with SOC and control groups. The above data show that soccer training alone improves more than normal growth maximum strength of the lower limps and agility. The addition of resistance training however, improves more maximal strength of the upper and the lower body, vertical jump height, and 30-m speed. Thus, the combination of soccer and resistance training could be used for an overall development of the physical capacities of young boys.

Wooden (1981) conducted a study on the effect of a circuit training program on body composition, muscular endurance and muscular strength in untrained females. Seventeen untrained females volunteered for either the experimental group (N=13) and the control group (N=4). All subjects were pre and post-tested. The experimental group participated in circuit training program. The result proved that there was no significant difference in total body weight change between groups, but there was a significant difference in change for body density, percentage of body, weight, muscular endurance and muscular strength between groups as a result of the circuit training program.

Olsen (1980) investigated the effects of a set circuit-training program on strength and muscular endurance of college age men. 42 college males participated in the study. Pre-test and Post-tests for strength and absolute muscular endurance and relative muscular endurance were given for the bench press and leg press. Treatment consisted of 2 workout sessions per week for 7 weeks. Test, re-test procedures and pre test and post test mean changes were analyzed using Pearson Correlation and dependent t-analyses. Absolute isolation and weekly workloads for progressive resistance exercise program were used to validate strength gains.

Charles (1967) conducted a study on the effect of circuit training exercise upon leg strength, free running speed and explosive power. He has taken an experimental group of 20 fresh male volunteers who were selected
random from trampoline and handball classes. The experimental group went for a 5 week, circuit training program of 8 stations with four sessions per week. The groups were tested before and after the program. The experimental group made significantly greater improvement in leg strength and explosive power but not in running speed.

2.3.3 Endurance

Padmanathan (2011) conducted a study on the effect of low impact aerobic exercises on selected health related physical fitness variables such as muscular endurance, cardio respiratory endurance, flexibility and body mass index of male adolescents. Their age ranged from 12 to 15 years. They were divided into two groups and designed as Experimental group ‘A’ and Control group ‘B’. The experimental group-A was given aerobic and calisthenics exercises for a period of twelve weeks, both morning and evening for five days in a week, whereas control group-B is not involved any specific exercise program other than their regular physical activities program as per their school curriculum. The result of this study indicated that muscular endurance and cardio respiratory endurance were significantly improved and also it was observed that Body Mass Index significantly reduced.

Lewis (2005) had conducted a study to determine the effects of a home exercise program of combined aerobic and strength training of fitness with a 10.5 year-old girl with Down syndrome (DS). Measurements included cardiovascular variables, strength, body composition, flexibility, and skill. The subject participated in a home exercise program: 30 to 60 minutes of moderate-to high-intensity exercise five to six days per week for six weeks. The cardiovascular variables monitored were heart rate, respiration rate, and oxygen consumption during a sub maximal treadmill stress test. Other measures included 10 repetitions maximal strength of selected muscle groups, body mass index, flexibility, Gross Motor Scales of the Bruininks-Oseretsky Test of Motor Proficiency, and anaerobic muscle power. Improvements in sub maximal heart and respiration rates, aerobic performance, muscle strength and endurance,
gross motor skills, and anaerobic power were observed for the subject. Body weight and flexibility were unchanged.

Stockton (1977) studied tenth grade girls at Belligham High School and were randomly assigned to four different conditioning programs: Calisthenics/Aerobic (N=19), aerobic (N=26), calisthenics/shuffling (N=31) and Callisthenes (N=26). The effectiveness of this conditioning programs in developing cardiovascular efficiency as measured by the Cotton Modified Step Test and muscular strength and muscular endurance as measured by the Oregon simplification of the PFI was determined, statistical procedure included ANOVA Scheffe’s Post-hoc analysis and t-ratio. Conclusions were: aerobic conditioning produced significant performance in muscular strength and muscular endurance.

Santo and others (1976) conducted a study to find the effect of physical conditioning program on selected physiological components of college men. The subjects were 76 men from a junior college. They were divided into four different groups who participated in different physical conditioning programs. One was a control group, which has no formal physical conditioning program. The experimental groups improved significantly in cardiovascular fitness in comparison to the control group.

Cooper (1975) studied the effects of an aerobic conditioning program on cardiovascular fitness of the school children. 12min run/walk test was administered to assess the cardiovascular fitness. A total of 1235 students participated in the program as subjects. The subjects were divided into an experimental group of 798 students and a control group of 437 students. Pre and post tests were administered to each student by Coopers 12 Min. run/walk test. The experimental group initially ran 5 to 6 minutes and then progressed to 14 minutes by the end of the term. The training was given for fifteen weeks. In addition to the aerobic conditioning program the experimental group adds jogging to their daily physical education classes, whereas the control group had
three normal activities only. From the results it was concluded that an endurance training program significantly improved the cardiovascular fitness.

Harper (1969) conducted a study of the effect of two physical conditioning programs on cardio-respiratory fitness of 25 college men. The subjects were placed into three group on the basis of maximum oxygen consumption one group participated in a modified army conditioning program and second group in interval training involving running. The third group (control) participated in recreational activities. The group met five days per week for seven weeks. Cardio-respiratory efficiency was measured with the help of the Harvard step Test. The results showed that both interval training and army trained groups improved significantly in their cardio-respiratory efficiency. The control group did not improve significantly.

Simmons (1967) studied the effect of circuit training upon Cardio-vascular condition and motor performance. 15 male students in required physical education course in circuit training showed statistically significant mean improvement in nine to fourteen cardio-vascular variables and in all 13 motor fitness variables. The training was done twice in a week in 30 minutes period and lasted 12 weeks.

2.3.4 Agility

Mr. Bujji Babu M. and Dr. P. Johnson (2012) investigated the effect of plyometric (PLYO) training and SAQ training for six week on speed and agility of male handball players. To achieve the purpose 30 male handball players were selected randomly from SAI Sports Training Centre Sarurnagar, Hyderabad, and Andhra Pradesh. The selected subjects were assigned into 3 groups: PLYO training (n=10), SAQ training group (n=10) and control (CON) group (n=10). Speed and agility was selected as criterion variable and tested by 30 meters sprint and T-test. The duration of the training prescribed in this study was six weeks that has been carried out during preparatory phase. Pretest and posttest data were measured on the handball field. The data was analyzed by
applying analysis of covariance (ANCOVA). The result of the study showed that the adjusted posttest mean is significant on speed ($F(2, 26) =3.592, p<0.05$) and agility ($F (2, 26) =46.88, p<0.05$). Further, it is found that SAQ training significantly improved the speed and agility of handball players compared to PLYO and CON group. In SAQ training group 2.02 and 7.17 percentage of improvement were noticed on speed and agility of male handball players.

Alauddin Shaikh and Dr. Samiran Mandal (2012) investigated that functional Training is how much certain movement will transfer into the actual activity of sport; it’s a matter of neural complexity and central nervous system demand. The aim of this study was to find out the effects of functional training on physical fitness components on male students. 19 male students from the Dr. Meghnad Saha College of the Gour Banga University, were randomly selected as subjects and their age were 19-25 years served as Functional Training Exercise, its three days per week for the period of eight weeks functional training exercises were given for experiments of a single group design. The functional training exercises was conducted in Ladder Forward & Sideward, Medicine ball throw Overhead-2kg, 3kg & 4kg, Hamstrings/Leg Curl With Stability Ball, Lateral Step Ups, Side Punk/Four Point Stabilizations Series, Forward Step Ups, Modified Pull-Up, Foot elevated hip lifting with medicine ball, Press Up with Stability Ball, Medicine Ball Throw Sideward Direction-4kg, 3kg and 2kg etc. before functional training exercises the functional warming up was to applied for tuning up the all body parts. The selected subjects were measured of their physical fitness components, speed, endurance, muscular endurance, strength, explosive power, agility and flexibility. Descriptive statistics was calculation for statistical the functional training exercises significantly increase speed, endurance, muscular endurance, strength, explosive power, agility and flexibility. The functional training has significantly improved speed, endurance, muscular endurance, strength, explosive power, flexibility and agility.
Dr. K. Abdussalam (2011) stated that it is needless to stress the fact that agility is the most important factor that contributes to successful performance in a broad spectrum of competitive sports. Here, the very purpose of the study was to examine whether there is any casual relationship with agility performance on the degree of functional flexibility. In order to conduct the experiment, 25 male physical education students of University of Mysore were taken at random to serve as subjects. All the twenty six students were tested before they were once again assigned to two experimental conditions viz, treatment and control conditions. The subjects in the treatment group were trained with five stretching exercises (both ballistic and static types) which were specially designed for the purpose for improving flexibility at trunk and hip. All the subjects of both control and experimental group were tested for agility before the treatment. Right Boomerang Run’ test was used to measure the agility as it was the most reliable and valid agility test compared to any other test. Sit and reach test was used to measure the flexibility of the hip and trunk. Each subject was given three trails to do his best. The best trail was used for the analysis. Analysis of Co-Variance (ANCOVA) was used to test the hypothesis. The pre test scores were used as (Covariate) control variable.

Amusa (1979) conducted a study on the relationship between playing ability and selected measures. Forty six subjects were well conditioned soccer players with at two years playing experience on the college level they were tested for running speed, power, agility, max Vo2, strength, anaerobic capacity and flexibility in addition eleven anthropometric measurements consisting of skin fold body diameters were taken. Soccer playing ability served as the criterion measures.

2.3.5 Reaction Time

Monika Garg and others (2013) investigated that physical exercise provides multiple benefits to an individual. However, the beneficial effect of exercise on psychomotor performance remains controversial. The present study was undertaken to determine the effect of aerobic exercise on auditory reaction
time (ART) and visual reaction time (VRT). Fifty subjects were enrolled consisting of healthy subjects who were not exercising (n=25; group I) and subjects doing regular aerobic exercisers (n=25; group II). ART and VRT were recorded using digital display response time apparatus equipped with three lights (red, green and yellow) and three auditory stimuli (low, medium and high pitched sounds). The mean VRT of group II subjects (318.24±6.709) was significantly lower than that of group I (505.78±16.961) (P<0.001). Then mean ART of group II subjects (313.33±8.160) was significantly lower than that of group I (573.09±17.950) (P<0.001). Auditory and visual reaction times are better in aerobic exercisers as compared to non-exercisers irrespective of age and gender.

2.4 Studies on General Physical Component

2.4.1 Weight

P. Mohanavalli and others (2013) examined the effect of Silambam practice on body composition and cardio vascular endurance among college girls. Silambam fencing is a martial art native to the soil of Tamil Nadu. It has been originated from 3000 B. C. and practiced by the pre-historic Dravidian Tamils who were dwelling from the Mohenjo-Daro & Harappa regions and is still practiced today. To achieve the purpose of this study, 40 sedentary college girls were selected as subjects. The age of the subjects were ranged from 18 to 20 years. The subjects were further classified at random into two equal groups of 20 subjects each. Group-I underwent Silambam training for three days per week for sixteen weeks and group – II acted as control. The selected criterion variables namely body weight, BMI, lean body mass, percent body fat and cardio vascular endurance were assessed before and after the training period. The collected data were statistically analyzed by using Analysis of Covariance (ANCOVA). From the results of the study it was found that there was a significant improvement in cardio vascular endurance and significant reduction in body weight, BMI, lean body mass, and percent body fat with no significant
change in agility among the experimental group when compared with the control group.

Ramesh and Subramaniam (2011) conducted a study on the effect of aerobic and calisthenics exercise on health related physical fitness variables such as muscular strength, muscular endurance, flexibility, cardio respiratory endurance and body mass index (BMI) of obese adolescents. Their age ranged from 12 to 18 years. They were divided onto two groups and designed as the experimental group and control group. The Experimental group was given aerobic and calisthenics exercise for a period of three months, both morning and evening for five days in a week. However, the control group was not allowed to participate in aerobic and calisthenics exercise training program. The result of this study indicated that muscular strength, muscular endurance, cardio respiratory endurance was significantly improved, and also it was observed that Body mass index significantly reduced.

In the study of Wilrike J. Pasman and others (1998) investigated whether endurance training is effective for successful long-term maintenance after weight reduction. Fifteen male obese subjects (age, 37.2±5.2 years; body weight (BW), 96.2±13.6kg, body mass index (BMI), 30.9±2.8 kg.m$^{-2}$) participated in a 16 month exercise-intervention study. During the first 4 months all subjects trained three to four times weekly, consuming a very low-energy diet (VLED) during the first 2 months. After the 4 month treatment period, seven subjects continued training for 12 months (3 to 4 times per week). The other eight subjects served a control group not involved in training program. The regain (increase during the intervention period as a percentage of the 4 month treatment) of BW at 16 months was 84% (±26%) for the whole group (trained v control, 52%± 28% V 74%±20% P=.09). The increase in absolute fat mass (FM) was significantly lower at 16 months for the training group (trained v control, 4.8 ±1.9 v 9.0±3.3 kg) as was the regain of FM at 16 months (trained v control, 61%±24% v 92% ±32%, p=.05). The amount of regain of the waist circumference, waist to hip ratio (WHR), and sagittal
diameter were correlated with the amount of training (hours) performed weekly (del. waist, r=-0.55, p<.05; del. WHR, r=-.50, p=.06; segittal diameter, r=-0.53, p<0.05). Physical fitness parameters (maximal power output [Wmax] and oxygen uptake [Vo2 max]) were significantly increased in both groups at 4 months. Trained subjects maintained high levels of physical at 16 months, in contrast to the group. In conclusion, although BW regain was not significantly different between the groups, trained subjects showed less regain of FM and higher levels of physical fitness, factor related to a lower risk for cardiovascular disease (CVD), compared with the control group. Furthermore, the regain of FM, which occurred even in the exercising group with a relatively intensive training program, suggests that maintenance of fat loss is extremely difficult.

The review of literature helped the researcher to compare with the variables and results of the present thesis. It also helped the researcher to make the appropriate hypothesis leading to the problem. Further the literature helped the researcher to support his findings with regard to the problem. Some literature helped the researcher how far his findings from other’s findings. Finally it helped the researcher to summarize his study.